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(54) PRODUCTION PLAN MAKING SUPPORT DEVICE

(57)Abstract:

PURPOSE: To provide a production plan making support device which can decide a combination of types between the 1st and 2nd products so as to secure the productivity of the 2nd products suitable to the 1st products and also to reduce the setup frequency of the 1st products and also can output the purchase quantity of the 1st products in every lot when plural types of 2nd products are produced by means of plural types of 1st products.

CONSTITUTION: A lot collection processing part 41 outputs the combination data on the correspondence between the intermediate and final products and also the quantity of intermediate products based on the data which are inputted from an input part 31. Based on the output of the part 41, a production order decision part 43 decides a production order of the intermediate products. Then a setup change frequency calculation part 45 calculates the setup change planning
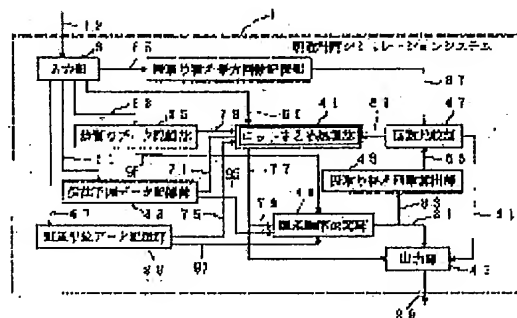
frequency for production of the intermediate products. A frequency comparison part 47 instructs the part 41 to repeat its processing if the planning frequency is larger than the maximum frequency.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the equipment used in order to
decide upon manufacturing planning of the secondary product in the case of
manufacturing a secondary product using primary products, such as a raw material, an
ingredient, and components. In detail While determining the combination which
matched the class of primary product in the case of manufacturing two or more kinds
of secondary products using two or more kinds of primary products, and the class of
secondary product, it is related with the technique for computing the amount of supply
of a primary product.

[0002]

[Description of the Prior Art] The various techniques for supporting decision of
manufacturing planning of a product conventionally are proposed. As the example,
there is "a manufacturing-planning listing device classified by items" of JP,3-
251348,A. When drawing up manufacturing planning of a metal mold shaping
product, in order that this equipment may attain the increase in efficiency of a
housekeeping substitute of metal mold, it is constituted so that the "lot conclusion"
which makes the net required number of a product a certain collected quantity may be
performed, and that concrete procedure is as follows. The demand forecast of each
item of the applicable moon is performed from the total sales quantity for every
product group including two or more items, the selling percentage of each item, and
the number of monthly selling fluctuation of each product group. And the percentage
of the number of demand forecasts of each item distributes the count which can
housekeeping change the shaping metal mold for one month according to items, and
the count of a housekeeping substitute of the applicable moon of each item is called
for. The lot conclusion days of each item are called for by breaking the days (an
example 30 days) of the applicable moon by this count.

[0003]

[Problem(s) to be Solved by the Invention] By the way, in an actual production
process, the secondary product as a result object is manufactured for primary
products, such as a raw material, an ingredient, and components, processing or by

carrying out assembly. And it is possible for there to be two or more classes of a primary product and secondary products, respectively, and to manufacture two or more kinds of secondary products generally, using a certain kind of primary product, for example about both relation, or in order to manufacture a certain kind of secondary product, it is possible to use alternatively the primary product of one class of two or more kinds of inside. In such a case, in choosing whether the kind of secondary product is manufactured using which kind of primary product, when there is need over a certain kind of secondary product, it is necessary to take into consideration the so-called "manufacturability", such as a yield about the combination for every class of a primary product and a secondary product, power cost and the depreciation expenses of the facility for manufacture, and a labor cost. Moreover, to manufacture two or more kinds of secondary products at a coincidence term, it is necessary to match the class of a primary product and secondary product, since the count of a housekeeping substitute of a primary product will increase so much and manufacture effectiveness will get worse, if there are many classes of primary product in a production process so that the class of primary product may decrease as much as possible. Furthermore, about supply of a primary product, although a primary product is manufactured in the same place of business or being purchased from other places of business, since it is usually manufactured or purchased per "lot" even if it is which case, it must decide upon a plan in consideration of these supply lots. Thus, in deciding upon manufacturing planning, there are various matters which should mind, but above-mentioned conventional equipment is begun, and the existing technique may not be enough for the function for coping with these, and it looks forward to the more excellent technique with it. This invention is what was invented in view of this actual condition. It is. Two or more kinds of primary products When using and manufacturing two or more kinds of secondary products, while the manufacturability over the primary product of a secondary product is suitable and determining the combination for every class of a primary product and a secondary product whose count of a housekeeping substitute of a primary product decreases as much as possible It is in offering the manufacturing-planning decision exchange equipment which can output the amount of supply of a primary product by the lot unit.
[0004]
[Means for Solving the Problem] In order to attain the above-mentioned purpose, the 1st invention It is equipment used in order to decide upon manufacturing planning of the 2nd product in the case of manufacturing two or more kinds of 2nd product using two or more kinds of 1st product. The manufacture amount required for every class of the 2nd product of the above, The manufacturability value for every class of the 2nd product of the above over the various kinds of the 1st product of the above, The input section for inputting the supply lot for every class of the 1st product of the above, It is manufacturing-planning decision exchange equipment characterized by including the lot conclusion processing section which outputs the class and the amount of supply of the 1st product of the above used in order to manufacture the various kinds of the 2nd

product of the above by which the manufacture demand was carried out based on the manufacture amount required, manufacturability value, and supply lot which were inputted from the above-mentioned input section. In the 2nd invention, the above-mentioned manufacturability value contains the yield. The above-mentioned lot conclusion processing section The combination generation section which generates the combination to which the 1st product of the above and the 2nd product of the above were made to correspond for every class, An output is answered from the above-mentioned combination generation section. The manufacture amount required of the various kinds of the 2nd product of the above with the above-mentioned combination It ** by the yield for every class over the 1st matched product of the. above. The lot matching processing section which computes the amount sum total of supply which carried out the integral multiple of the above-mentioned supply lot for calculating the initial complement for every class of the 1st product of the above, and satisfying the sum total of the initial complement for every class of the 1st product of the above, The term which answers an output from the above-mentioned lot matching processing section, and becomes settled by the yield of the whole to the amount sum total of supply of the 1st product of the above of the sum total of the manufacture amount required of the 2nd product of the above, The combination evaluation section which evaluates the above-mentioned combination using a performance index including the term which becomes settled with the number of classes of the 1st product of the above contained in the above-mentioned combination is included. The above-mentioned combination generation section It is manufacturing-planning decision exchange equipment which carries out sequential generation of the different combination according to evaluation by the above-mentioned combination evaluation section, and is characterized by the above-mentioned combination evaluation section outputting the combination from which the value of the above-mentioned performance index serves as best among the combination by which sequential generation was carried out [above-mentioned].

[0005] The 3rd invention is manufacturing-planning decision exchange equipment characterized by the above-mentioned combination evaluation section including the term which becomes settled with the number of the classes whose classes of the 2nd product of the above further used for manufacture among the 1st product of the above contained in the above-mentioned combination are below a predetermined number in the above-mentioned performance index. The manufacture sequence decision section as which, as for the 4th invention, the above-mentioned equipment determines the manufacture sequence of the 2nd product of the above further based on the output of the above-mentioned lot conclusion processing section, The count calculation section of a housekeeping substitute which computes the count of a housekeeping substitute of the 1st product of the above based on the output from the above-mentioned manufacture sequence decision section, The count comparator which measures the count of an upper limit beforehand appointed at the count which the above-mentioned count calculation section of a housekeeping substitute computed is included. The

above-mentioned lot conclusion processing section Furthermore, when judged with there being more computed counts than the above-mentioned count of an upper limit by the above-mentioned count comparator, it is manufacturing-planning decision exchange equipment characterized by making the weighting factor of the term which becomes settled with the number of classes of the 1st product of the above in the above-mentioned performance index increase, and repeating processing again.
[0006]
[Function] According to the 1st invention, it is based on the manufacture amount required for every class of the 2nd product inputted from the input section, the manufacturability value for every class of the 2nd product over the various kinds of the 1st product, and the supply lot for every class of the 1st product. By the lot conclusion processing section The class and the amount of supply of the 1st product used in order to manufacture the various kinds of the 2nd product by which the manufacture demand was carried out are outputted. If the manufacture amount required, the manufacturability value containing the yield, and a supply lot are inputted from the input section according to the 2nd invention, in the lot conclusion processing section, the combination to which the 1st product and 2nd product were made to correspond for every class by the combination generation section will be generated. An output is answered from this combination generation section, the manufacture amount required of the various kinds of the 2nd product is **(ed) by the lot matching processing section by the yield for every class over the 1st product matched with the above-mentioned combination, the initial complement for every class of the 1st product is calculated, and the sum total of the amount of supply which carried out the integral multiple of the supply lot for satisfying the sum total of the initial complement for every class of the 1st product further is computed. An output is answered from this lot matching processing section, and the above-mentioned combination is estimated by the combination evaluation section using a performance index including the term which becomes settled by the yield of the whole to the sum total of the amount of supply of the 1st product of the sum total of the manufacture amount required of the 2nd product, and the term which becomes settled with the number of classes of the 1st product contained in the above-mentioned combination. According to this evaluation, the combination from which sequential generation of the combination which changes with above-mentioned combination generation sections is carried out, and the value of the above-mentioned performance index serves as best among the generated combination is outputted by the combination evaluation section.
[0007] According to the 3rd invention, in addition to the term which becomes settled by the yield of the whole above, and the term defined with the number of classes of the 1st product of the above, the term which becomes settled with the number of the classes whose classes of the 2nd product used for manufacture among the 1st product contained in the above-mentioned combination are below a predetermined number is included in the above-mentioned performance index, and the above-mentioned combination is evaluated using this performance index. According to the 4th

invention, the manufacture sequence of the 2nd product is determined by the manufacture sequence decision section based on the output from the above-mentioned lot conclusion processing section, and the count of a housekeeping substitute of the 1st product is further computed by the count calculation section of a housekeeping substitute based on this manufacture sequence. And when the count of an upper limit beforehand appointed at the count of calculation of the above-mentioned count calculation section of a housekeeping substitute is measured by the count comparator and it judges many [the count of calculation] rather than the count of an upper limit, the weighting factor of the term which becomes settled with the number of classes of the 1st product in a performance index is made to increase by the above-mentioned lot conclusion processing section, and processing is repeated again.

[0008]

[Example] The example which materialized this invention with reference to the accompanying drawing is explained hereafter, and an understanding of this invention is presented. In addition, although the following examples show the configuration of the manufacturing-planning simulation system used in order to decide upon manufacturing planning of the final product in the case of manufacturing two or more kinds of final products using two or more kinds of intermediate products, this is an example which materialized this invention and is not the thing of the character which limits the technical range of this invention. Drawing 1 is the block diagram showing I/O of the data of the inventory plan simulation system (only henceforth a "system") 1 of this example. The order-received prediction data 11 which express prediction of the amount of orders received for every class of final product in a certain fixed period with a system 1 as illustrated, The yield data 13 showing the yield to the intermediate product of a final product, and the count data 14 of housekeeping substitute max showing the count of max of a housekeeping substitute of the intermediate product in the above-mentioned fixed period, The manufacture unit data 15 showing the manufacture unit of an intermediate product, the conclusion array initial data 16 showing the initial value of a conclusion array (after-mentioned), and the array modification data 17 showing the modification approach (after-mentioned) of a conclusion array are inputted through a signal line 19. Moreover, from a system 1, the lot conclusion data 21 showing matching with an intermediate product and a final product for every class and the amount of manufactures of an intermediate product, the manufacture sequence data 23 showing the manufacture sequence of the intermediate product within a fixed period, and the count data 25 of a housekeeping substitute plan showing the count of a plan of a housekeeping substitute of the intermediate product within a fixed period are outputted through a signal line 29.

[0009] Drawing 2 is the block diagram showing the functional configuration inside a system 1. A system 1 contains the input section 31, the order-received prediction data storage section 33, the yield data storage section 35, the count storage section 37 of housekeeping substitute max, the manufacture unit data storage section 39, the lot conclusion processing section 41, the manufacture sequence decision section 43, the

count calculation section 45 of a housekeeping substitute, the count comparator 47, and the output section 49. The input section 31 is a means for inputting data into a system 1 from the exterior, and the signal line 19 is connected. The input section 31 is connected with the order-received prediction data storage section 33, the yield data storage section 35, the count storage section 37 of housekeeping substitute max, the manufacture unit data storage section 39, and the lot conclusion processing section 41 through signal lines 61, 63, 65, 67, and 69, respectively. Among each signal line for read-out of the order-received prediction data storage section 33, the yield data storage section 35, and the manufacture unit data storage section 39, signal lines 71, 73, and 75 are connected to the lot conclusion processing section 41, and signal lines 95, 96, and 97 are connected to the manufacture sequence decision section 43.

[0010] The signal line 77 for the output of the lot conclusion processing section 41 is connected to the output section 49, and the signal line 79 which branches from a signal line 77 is further connected to the manufacture sequence decision section 43. The signal line 81 for the output of the manufacture sequence decision section 43 is connected to the output section 49, and the signal line 83 which branches from a signal line 81 is further connected to the housekeeping substitute calculation section 45. The signal line 85 for an output of the housekeeping substitute calculation section is connected to the count comparator 47, and the signal line 87 for an output of the count storage section 37 of housekeeping substitute max is connected to other input terminals of this count comparator 47. Moreover, the signal lines 89 and 91 for an output of the count comparator 47 are connected to the lot conclusion processing section 41 and the output section 49, respectively.

[0011] Drawing 3 is the block diagram showing the functional configuration inside the lot conclusion processing section 41. The lot conclusion processing section 41 contains the conclusion array generation section 101, the lot matching processing section 103, the array evaluation section 105, the weight value modification section 107, and the weight value storage section 109. The signal line 69 from the input section 31 is connected to the conclusion array generation section 101. This signal line 69 contains a signal line 111 and a signal line 113. The signal lines 71, 73, and 75 from the order-received prediction data storage section 33, the yield data storage section 35, and the manufacture unit data storage section 39 are connected to the lot matching processing section 103. The signal line 89 from the count comparator 47 is connected to the weight value modification section 107.

[0012] Furthermore, the signal line 115 for the output from the conclusion array generation section 101 is connected to the lot matching processing section 103. The signal line 117 for the output from the lot matching processing section 103 is connected to the array evaluation section 105. The signal line 119 for the output from the array evaluation section 105 is connected to the conclusion array generation section 101. From the array evaluation section 105, data are outputted to the exterior of the lot conclusion processing section 41 through a signal line 77. One signal line 123 for an output of the weight value modification section 107 is connected to the

weight value storage section 109, and another signal line 127 for an output is connected to the conclusion array generation section 101. The signal line 125 for the output from the weight value storage section 109 is connected to the array evaluation section 105.

[0013] Next, with reference to drawing 4 - drawing 9 , the contents of the data inputted into a system 1 are explained. In addition, this example explains the simulation of manufacturing planning in the case of manufacturing final products a, b, and c using intermediate products A, B, and C. The unit of the amount of the product in each drawing is "a ton (henceforth "t")."

[0014] Drawing 4 is the explanatory view showing the contents of the order-received prediction data 11. The order-received prediction data 11 contain the daily amount of order-received prediction of each final product in a fixed period (an example for ten days). A final product a will have the order received pert from the 1st to the 3rd, there is no order received on the 4th, and it is predicted further that there will be an order received pert from the 5th to the 10th. Moreover, it is predicted that a final product b has the order received pert in each of the 9th day and the 10th day [the 1st day and / the 3rd day and / the 5th day and / the 7th day and]. It is predicted that a final product c will have an order received of every 0.5t with the 1st day on the 3rd, will have a 1t order received on the 6th, and will have a 0.5t order received on the 9th.

[0015] Drawing 5 is the explanatory view showing the contents of the yield data 13. The yield data 13 express the yield to the intermediate product of a final product [in / for the class of intermediate product, and the class of final product / matching and each matching] with a table format. It is expressed with the example that 1.0 and a final product c are manufactured for a final product a by the yield of 0.9 using an intermediate product A. Moreover, it is meant using the intermediate product B that 1.0 and a final product c are manufactured for a final product b by the yield of 0.8. It is meant further again using the intermediate product C that a final product b is manufactured by the yield of 0.7. In addition, in this data, when the yield is 0.0, it means that a final product cannot be manufactured using that intermediate product. That is, he is trying for the value of the yield to also express good/failure of manufacture between an intermediate product and a final product in this example. With 0.3 [or more], as criteria showing good/failure of manufacture, it can manufacture by making 0.3 of the yield being not only 0.0 but the yield into a threshold, and with 0.3 [less than], you may make it that it cannot manufacture and carve.

[0016] Drawing 6 is the explanatory view showing the contents of the count data 14 of housekeeping substitute max. The count data 14 of housekeeping substitute max express the count of max in which the housekeeping substitute in each of a predetermined period (an example ten days, 20 days, for 30 days) is possible. It is expressed by the example in 4 times and 30 days in 2 times and 20 days in ten days that six housekeeping substitutes are possible.

[0017] Drawing 7 is the explanatory view showing the contents of the manufacture

unit data 15. The manufacture unit data 15 express the manufacture unit (lot) of each intermediate product. In an example, both the manufacture units of an intermediate product A and an intermediate product B are 6t, and the manufacture unit of an intermediate product C is 8t. This manufacture unit turns into a request unit when requiring an intermediate product, in order to manufacture a final product. Drawing 8 is the explanatory view showing the contents of the conclusion array initial data 16 and the array modification data 17. In performing lot conclusion processing, in this example, the array showing how the conclusion array generation section 101 packs a lot is generated. The initial value of the array inputted into this conclusion array generation section 101 is the array initial data 16 collectively. The example of the conclusion array initial data 16 is shown in drawing 8 (a). The combination array expresses that a final product a is manufactured using an intermediate product A, and final products b and c are manufactured using an intermediate product B in the example. Drawing 8 (b) is an example of the array modification data 17. Although the conclusion array generation section 101 carries out sequential generation of the conclusion array of different combination, when it generates an array, it changes the contents of the array generated by then, and generates a new array. The modification approach at this time is beforehand inputted into the conclusion array generation section 101 with the array modification data 17. The modification approach shown in drawing 8 (b) means that the final product a matched with the intermediate product A and the final product c matched with the intermediate product B can be renewed in the array data generated previously. If it applies to the initial data of the array which showed this modification approach to drawing 8 (a), the conclusion array of drawing 8 (c) will newly be generated. However, in this conclusion array, it is shown that a final product a is manufactured from an intermediate product B, and it is not suitable by the contents of the yield data 13 shown in drawing 5 .

[0018] If the modification approach is set up to the conclusion array shown in drawing 8 (a) corresponding to the contents of the yield data 13 of drawing 5 , it becomes like drawing 8 (d). By this modification approach, " " of an alphabetic character tooth space is set up as a final product matched with the intermediate product A. That is, it will change into the final product matched with the intermediate product A, and there will be no target thing. And the final product c is chosen from the final products matched with the intermediate product B. Thereby, in the conclusion array of drawing 8 (a), the final product c corresponding to an intermediate product B is replaced with " " corresponding to an intermediate product A, and the conclusion array of drawing 8 (e) is newly generated. It means changing matching of a final product c into an intermediate product A from an intermediate product B by setting " " as one exchange target in the case of the modification approach shown in drawing 8 (d), as illustrated.

[0019] Drawing 8 (f) is an example when inputting the modification approach of an array. The modification approach of an array continues and inputs the conclusion array set as the object of modification, and the modification approach. When there are

two or more modification approaches to one conclusion array, they are continued and it inputs at once. In the example, as for the modification approach, three, A-, B-c, A-a and B-c, and A-a and B-b, are inputted to the conclusion array A [a] and B [b, c]. In addition, this example is for explaining an input procedure, and is not a thing in consideration of the contents of the yield data 13 of drawing 5 .

[0020] In addition, although the example explained above is a thing at the time of constituting each part from a separate circuit, it is also possible to realize the same function in the combination of a microprocessor and memory. In any case, actuation of a system 1 is as follows.

[0021] Drawing 9 is a flow chart which shows the operations sequence of a system 1. According to the contents of this drawing 9 , the contents of manufacturing-planning simulation are explained with reference to drawing 1 - drawing 8 , and drawing 10 - drawing 12 if needed. First, with reference to drawing 1 , the order-received prediction data 11, the yield data 13, the count data 14 of housekeeping substitute max, the manufacture unit data 15, the conclusion array initial data 16, and the array modification data 17 are inputted (step 1 (henceforth "S")). With reference to drawing 2 , each data is inputted from the input section 31 through a signal line 19, and is sent to the interior of a system 1 through signal lines 61, 63, 65, 67, and 69. the sent data -- respectively -- the order-received prediction data 11 -- the order-received prediction data storage section 33 -- the count data 14 of housekeeping substitute max are memorized by the count storage section 37 of housekeeping substitute max, and the manufacture unit data 15 are memorized for the yield data 13 by the yield data storage section 35 at the manufacture unit data storage section 39. The conclusion array initial data 16 and the array modification data 17 are sent to the lot conclusion processing section 41 through a signal line 69. Inside the lot conclusion processing section 41, the array modification data 17 are inputted into the conclusion array generation section 101 for the conclusion array initial data 16 through a signal line 113 through a signal line 111, respectively (refer to drawing 3).

[0022] Next, the lot conclusion processing section 41 reads the amount of order-received prediction of each final products a, b, and c from the order-received prediction data storage section 33 through a signal line 71 (refer to drawing 2), and computes the sum total of the amount of order-received prediction for every final product (refer to drawing 4) (S2). The calculation result of the sum total of the amount of order-received prediction is shown in drawing 10 . In this drawing, the sum totals of the amount of order-received prediction for ten days of each final products a, b, and c are 9t, 6t, and 2.5t. Calculation of the amount sum total of order-received prediction is performed in the lot matching processing section 103 (refer to drawing 3) inside the lot conclusion processing section 41. The lot matching processing section 103 memorizes the computed amount sum total of order-received prediction in internal memory (illustration is omitted), and equips with it the processing mentioned later.

[0023] Next, the conclusion array which expresses how to the intermediate product of

a final product to collect with the conclusion array generation section 101 is generated (S3). If the evaluation value over a certain array and the modification approach (above-mentioned) of an array are inputted, the conclusion array generation section 101 is constituted by changing the array which exists the account of a top according to the modification approach so that an array in which an evaluation value turns into a more desirable value using a combination optimization technique may newly be generated. What is necessary is just to use for example, the SHIMYURETEDDO annealing method (Kirkpatrick, S., et.al."Optimization by Simulated Annealing", Science, 13 May 1983, Vol.220, No.4598 (1983), 671-) as a combination optimization technique. The conclusion array which the conclusion array generation section 101 outputs first is an array (refer to drawing 8 (a)) in which it was initialized through the signal line 111 and which collects and is included in the array initial data 16. If computed by the processing which the evaluation value over this array mentions later, the conclusion array generation section 10 will generate a new array based on an evaluation value. By repeating this, sequential generation of the different conclusion array is carried out.

[0024] The array data which the conclusion array generation section 101 generated are sent to the lot matching processing section 103 through a signal line 115. The lot matching processing section 103 performs lot matching processing for performing matching with the intermediate product and final product for manufacturing the final product for the amount sum total of order-received prediction computed by the above S2 according to the sent array data for every class, and calculation of the amount of manufactures for every class of intermediate product (S4). The processing result of the lot matching processing section 103 is sent to the array evaluation section 105 through a signal line 117.

[0025] the array evaluation section 105 -- evaluation value $=W1 \times$ yield loss $+W2$ -- it collects using the performance index expressed with the formula of the number of the intermediate product classes outside a number of x intermediate product classes $+W3 \times$ criterion, and an array is evaluated. A yield loss is the rate of the total indicator of the amount of demand forecasts of final products a, b, and c to total indicator of the amount of manufactures of intermediate products A and B. Since an intermediate product is two kinds such as A and B in the conclusion array which the number of intermediate product classes is the number of classes of the intermediate product contained in the result of lot matching processing, for example, was shown in drawing 8 (a), this value is set to "2." The number of the intermediate product classes outside a criterion is a value as which the intermediate product whose class of final product manufactured using the intermediate product is below a predetermined number expresses which is contained. That is, the more many intermediate products with the versatility which can do ** used for manufacture of two or more kinds of final products are used, the more it becomes easy to change the class of final product to manufacture according to the case where a gap is in order-received prediction etc. So, in this example, the intermediate product which can be used for manufacture of two or

more kinds of final products was used as the "standard intermediate product", and the intermediate product which can be used only for manufacture of one kind of final product was used as "the intermediate product outside a criterion." And the term about the number of classes of the intermediate product outside this criterion is included in the function by which a conclusion array is evaluated, the versatility of an intermediate product is summarized, and it is made an element of evaluation of an array. W1 contained in each term of the above-mentioned performance index, W2, and W3 It is a weighting factor for adjusting whenever [to the evaluation value of each item / effect]. These multipliers W1 - W3 The weight value storage section 109 memorizes beforehand, and it is read by the array evaluation section 105 at the time of array evaluation. The evaluation result by the array evaluation section 105 is summarized through a signal line 119, and is sent to the array generation section 101.

[0026] Based on the sent evaluation value, the conclusion array generation section 101 performs combination optimization processing, changes the conclusion array generated last time according to the array modification approach (above-mentioned), and it generates a new conclusion array so that a more desirable evaluation value may be acquired. In addition, in the above-mentioned performance index, it is a combination array more desirable as an evaluation value is small. Newly generated evaluation according to an array, the lot matching processing section 103 performs lot matching processing collectively, and according [the array evaluation section 105] to the above-mentioned performance index based on (S4) and its processing result is performed (S5). Thus, evaluation processing of lot matching processing and an array whenever a different conclusion array collects and sequential generation is carried out from the array generation section 101 is performed. And it judges that the array evaluation section 105 is a conclusion array best in the conclusion array which acquired the minimum evaluation value when the evaluation value stopped becoming small (it is YES at S6), and collects into the exterior of the lot conclusion processing section 41 through a signal line 77, and array data and the processing result of lot matching are outputted. In addition, when the describing [above] SHIMYURETEDDO annealing method is used, even if an evaluation value becomes larger than the last conclusion array in evaluating an array, there is the description of approving if it is predetermined within the limits etc., and when it matches the class of intermediate product, and the class of final product like this example, it can be said that it is the outstanding technique of the ability to search for the best combination easily.

[0027] An example of the lot conclusion result outputted from the lot conclusion processing section 41 in this example is shown in drawing 11 . In this example, 9t of a final product a and 2.5t of a final product c of the amount of order-received prediction of the final product shown in drawing 10 are manufactured using an intermediate product A, and 6t of a final product b is manufactured using an intermediate product B. Since it is 9/1.0+2.5/0.9=11.78(the third place is rounded off below decimal point) t and the manufacture unit of an intermediate product A is 6t (refer to drawing 7)

when the initial complement of an intermediate product A is computed using the yield data 13 shown in drawing 5 , the amount of manufactures is set to 12t for two lots. Moreover, since the yield to the intermediate product B of a final product b is 1.0, the initial complement of an intermediate product B is 6/1.0=6t, and 6t for one lot of an intermediate product B becomes the amount of manufactures. In addition, the part L1 shown with the slash in drawing 11 and L2 It is a yield loss and is L1. It is the loss produced from the yield (refer to drawing 5) to the intermediate product A of a final product c, and L2 is a loss produced from the rate to the manufacture unit of the intermediate product A of the amount of order-received prediction of final products a and c. At the above-mentioned performance index, they are these [L1]. L2 It is L1 although the total yield loss was used. L2 It is made a separate term and you may make it use the value which multiplied by weighting factor which is different in each. With reference to drawing 2 , while collecting and sending an array and the result of lot matching processing to the output section 49, it is sent to the manufacture sequence decision section 43 through the signal line 79 which was outputted through the signal line 77 and which branches from a signal line 77. The output section 49 has memory (illustration is omitted), and stores the result of the lot conclusion sent from the lot conclusion processing section 41 in this memory.

[0028] Moreover, in the manufacture sequence decision section 43, the manufacture sequence of an intermediate product is determined based on the result of a lot conclusion (S7). The manufacture sequence of an intermediate product is determined by the following procedures. If the result of a lot conclusion is sent from the lot conclusion processing section 41, from each of the order-received prediction data storage section 33, the yield data storage section 35, and the manufacture unit data storage section 39, the manufacture sequence decision section 43 will read order-received prediction data (refer to drawing 4), yield data (refer to drawing 5), and manufacture unit data (refer to drawing 7), and will compute the initial complement of the intermediate product in each day for every final product when an order received is predicted. In this drawing, since it is manufactured by the yield 1.0 from an intermediate product A about a final product a, the every 1t intermediate product A is needed on each day corresponding to the order-received prediction day of a final product a. About the final product c, similarly 0.56(the third place is rounded off below decimal point) t is needed on the amount, i.e., the 1st day, which **(ed) the amount of order-received prediction of each day by the yield 0.9, the 3rd, and the 9th, and 1.11t is needed on the 6th, respectively.

[0029] Then, the manufacture sequence decision section 43 totals the initial complement in each day for every intermediate product, as shown in drawing 13 . In order that an intermediate product A may manufacture a final product a and a final product c, 1.56t is needed at a time for each of the 3rd day and the 9th day [the 1st day and], 1t is needed at a time for each of the 8th day and the 10th day [the 2nd day and / the 5th day and / the 7th day and], and 2.11t is needed on the 6th. Moreover, in order to manufacture a final product b, 1t of intermediate products B is needed at a

time for each of the 9th day and the 10th day [the 1st day and / the 3rd day and / the 5th day and / the 7th day and]. The manufacture sequence decision section 43 will make from the 1st to the day 1 time of a manufacture horizon, if an initial complement is added sequentially from the 1st day and the amount results per manufacture of an intermediate product (refer to drawing 7) about each intermediate product. And the manufacture sequence decision section 43 computes sequential manufacture timing even for the day next to per manufacture from the final day of the manufacture horizon as a next manufacture horizon.

[0030] For example, in drawing 13 , if the initial complement of an intermediate product A is added sequentially from the 1st day and it goes, it will result in 7.23t which will exceed 6t of a manufacture unit in the 6th day. The 6th day after this day becomes the manufacture horizon of the beginning of an intermediate product A. All the initial complements in a manufacture horizon shall complete manufacture on the first day (the 1st day in this case) of that period. If 6t will be manufactured on the 1st, 7.23-6=1.23t of the 7.23t needed from the 1st to the 6th runs short. These 1.23t becomes the amount of addition of the first time in the next manufacture horizon. That is, the next manufacture horizon makes the 6th day the first day, and the amount of manufactures is set to 5.79t which added each initial complement on seven - the 10th to the above-mentioned 1.23t. At this example, since a time horizon is from the 1st to the 10th, even if it is the case where the initial complement of the 2nd manufacture horizon does not result per manufacture (6t), a manufacture horizon will be terminated in these 10th day. In the above procedure, it is planned that manufacture of an intermediate product A will manufacture 6t on the 1st, and will manufacture 6t on the 6th. Similarly, about an intermediate product B, the sum total of the initial complements from the 1st to the 10th is 6t, and will result in 6t which is a manufacture unit in the 10th day. Therefore, the manufacture horizon of an intermediate product B will be from the 1st till the 10th, and manufacturing 6t on the 1st is planned.

[0031] Next, the manufacture sequence decision section 43 determines the manufacture sequence of an intermediate product based on the above-mentioned manufacturing planning. In this case, when two or more kinds of intermediate products are manufactured in the same day, the manufacture sequence decision section 43 is planned so that the intermediate product of the same class as the intermediate product with which manufacture is planned on the nearest day after that day may be manufactured at the end. For example, in the example shown in drawing 13 , although manufacture with an intermediate product A and an intermediate product B is planned in the 1st same day, since the nearest next manufacturing-planning day is the 6th day which is the 2nd manufacture date of an intermediate product A, an intermediate product B is manufactured first and an intermediate product A will be manufactured after that in this case, on the 1st. Therefore, the manufacture sequence of an intermediate product will become B->A->A by the 1st to the 10th day of a time horizon. Decision processing of the manufacture sequence

mentioned above may be made to deform as follows. For example, for every class of intermediate product, by dividing a horizon (for ten days) by the manufacture number of unit (the number of lots), a manufacture stage is computed and it is set according to predetermined conditions based on this manufacture stage. For example, since the amounts of manufactures of an intermediate product A are two lots, manufacture spacing is 10/2=5(Sun.), and the manufacture stage of an intermediate product A will be made into the 6th day with the 1st day. Moreover, since an intermediate product B arranges a part for one lot, manufacture spacing is set to 10/1=10(Sun.), and it makes the manufacture stage of an intermediate product B the 1st day. Here, if the manufacture conditions of giving priority to and manufacturing the intermediate product B for example, from the intermediate product A are set up, the manufacture sequence that an intermediate product B is manufactured and an intermediate product A will be again manufactured after that on the 5th after an intermediate product B is manufactured and manufacture of final products a and b is completed can be determined on the 1st. In addition, what is necessary is just to define the target intermediate product in consideration of a class, a manufacturing facility, etc. of a final product about the conditions for determining this manufacture sequence. The manufacture sequence determined by the manufacture sequence decision section 43 is sent to the housekeeping substitute calculation section 45 through the signal line 83 which branches from a signal line 81 while it is sent to the output section 49 through a signal line 81. The output section 49 stores the sent manufacture sequence in internal memory (above-mentioned).

[0032] Then, based on the sent manufacture sequence, the count of a plan of a housekeeping substitute of an intermediate product is computed by the count calculation section 45 of a housekeeping substitute (S8). The contents of calculation of the count of a plan of a housekeeping substitute are shown in drawing 14 . In this drawing, an intermediate product B is manufactured first, an intermediate product A is manufactured after that, and it is meant on the 1st that an intermediate product A will be manufactured on the 6th. In this case, since the manufacture sequence of an intermediate product serves as B-A-A, a housekeeping substitute becomes 1 time on the 1st. The count of a plan of the housekeeping substitute which the count calculation section 45 of a housekeeping substitute computed is sent to the count comparator 47 through a signal line 85. The count comparator 47 reads the count of max of a housekeeping substitute (above-mentioned) from the count storage section 37 of housekeeping substitute max through a signal line 87, measures the count of max, and the count of a plan to have been sent, and judges whether the count of a plan is below a count of max (S9). The count comparator 47 will send the signal showing that to the lot conclusion processing section 41 through a signal line 89, if the count of a plan is not below a count of max (it is NO at S9). Weighting factor [as opposed to / inside the lot conclusion processing section 41 (refer to drawing 3), the weight value modification section 107 answers a signal from a signal line 89, and / the number of intermediate product classes of the above-mentioned performance index] W2 A

modification value is outputted. This modification value is sent to the weight value storage section 109 through a signal line 123, and is memorized by the weight value storage section 109. W2 A value is changed (S10). Furthermore, from the weight value modification section 107, the signal of the purport which summarized through the signal line 127 and modification of a weight value completed to the array generation section 101 is sent. The conclusion array generation section 101 answers this signal, and performs generation processing of a conclusion array again (S3). Thereby, processing of the above S3-S6 winds, and it is **********. However, it sets to the above-mentioned performance index, and the array evaluation section 105 is a weighting factor W2. Since it is made to increase, it collects so that the evaluation to the number of classes of an intermediate product may become severe and the count of a plan of the part of a housekeeping substitute of an intermediate product may become less than the time of the last lot conclusion processing, and an array is chosen.

[0033] Weighting factor W2 Based on the result of the lot matching processing in which collected and an array and its array were followed newly chosen in the performance index to which it was made to increase, as mentioned above By the count of a plan and the count of max being compared by the count comparator 47 through manufacture sequence decision processing of S7, and calculation processing of the count of a plan of a housekeeping substitute of S8, again, if the count of a plan is larger than the count of max, (S9) and here Again, it is a weighting factor W2. After making it increase, processing of (S10) lot conclusion processing section 41 of S3-S6 is repeated. The count comparator 47 will send the count of a plan to the output section 49 through a signal line 91, if the count of a plan to have been computed is below a count of max (it is YES at S9). The output section 49 answers that the count of a plan of a housekeeping substitute has been sent from the count comparator 47, and outputs the lot conclusion data 21 stored in internal memory with the count data 25 of a plan of a housekeeping substitute, and the manufacture sequence data 23 to the exterior of a system 1 through a signal line 29 (S11).

[0034] In the above, the example of this invention was explained. The characteristic configuration of this example is described below. The input section for inputting the manufacture amount required for every class of the 2nd product, the manufacturability value for every class of the 2nd product over the various kinds of the 1st product, and the supply lot for every class of the 1st product by the above-mentioned input section 31 is constituted. The lot conclusion processing section which outputs the class and the amount of supply of the 1st product used in order to manufacture the various kinds of the 2nd product by which the manufacture demand was carried out based on the manufacture amount required, manufacturability value, and supply lot which were inputted from the input section consists of the above-mentioned lot conclusion processing sections 41. The combination generation section which carries out sequential generation of the combination which changes with above-mentioned conclusion array generation sections 101 according to evaluation by the combination generation section which generates the combination to which the 1st product and 2nd

product were made to correspond for every class, and the combination evaluation section is constituted. The lot matching processing section which computes the sum total of the amount of supply which carried out the integral multiple of the supply lot for answering an output from the combination generation section, **(ing) the manufacture amount required of the various kinds of the 2nd product by the yield for every class over the 1st product matched by combination, and satisfying the sum total of the initial complement for every class of the 1st product by the above-mentioned lot matching processing section 103 is constituted.

[0035] Moreover, an output is answered from the lot matching processing section by the above-mentioned array evaluation section 105. The term which becomes settled by the yield of the whole to the sum total of the amount of supply of the 1st product of the sum total of the manufacture amount required of the 2nd product, With the number of classes of the 1st product contained in combination Evaluate combination using a performance index including the term which becomes settled, output the combination from which the value of a performance index serves as best among the combination by which sequential generation was carried out, and further with the number of the classes whose classes of the 2nd product used for manufacture among the 1st product contained in combination are below a predetermined number The combination evaluation section which includes the term which becomes settled in the above-mentioned performance index is constituted. Furthermore, in an above-mentioned example, the above-mentioned order-received prediction data 11 are equivalent to the manufacture amount required for every class of the 2nd product, and the above-mentioned yield data 13 are equivalent to the manufacturability value for every class of the 2nd product over the various kinds of the 1st product. Moreover, the above-mentioned manufacture unit data 15 are equivalent to the supply lot for every class of the 1st product.

[0036] Furthermore, other focus of an above-mentioned example is described. The manufacture sequence decision section as which the above-mentioned system 1 determines the manufacture sequence of the 2nd product further based on the output of the lot conclusion processing section, The count calculation section of a housekeeping substitute which computes the count of a housekeeping substitute of the 1st product based on the output from the manufacture sequence decision section, The count comparator which measures the count of an upper limit beforehand appointed at the count which the count calculation section of a housekeeping substitute computed is included. The above-mentioned lot conclusion processing section Furthermore, when judged with there being more computed counts than the above-mentioned count of an upper limit by the count comparator, it is characterized by making the weighting factor of the term which becomes settled with the number of classes of the 1st product in a performance index increase, and repeating processing again.

[0037] In addition, in the above-mentioned example, although the intermediate products A and B in a production process were made into the example as the 1st product of the above, the 1st product is not restricted to an intermediate product and

contains widely the so-called primary products, such as a raw material used in order to manufacture a certain product, an ingredient, and components. Similarly, as the 2nd product, although the final products a, b, and c of a production process were made into the example, the 2nd product contains widely the so-called secondary product obtained as a result object which processed or assembled the above-mentioned raw material, an ingredient, components, etc. Moreover, although the information on the manufacture based on the yield and it related possible/impossible was used as a manufacturability value, it is not restricted to this and you may make it use synthetically or alternatively the information about power cost, the depreciation expenses of the facility for manufacture, a labor cost, etc. for others.

[0038] Furthermore, although the possible/impossible correspondence relation of manufacture to an intermediate product and a final product was judged based on the value of the yield data 13, manufacture propriety data as shown in drawing 15 are inputted separately, and you may make it judge possible/impossibility of manufacture in the above-mentioned example based on this data. Furthermore, the conclusion array initial data 16 inputted into the conclusion array generation section 101 is not inputted from the outside through the input section 31 again, but you may make it establish a means to generate automatically based on manufacturability values including the above-mentioned yield data 13 or manufacture propriety data (to refer to drawing 13). Similarly, also about the modification approach of a conclusion array, it may not input from the outside but a means by which the modification approach is set automatically may be included based on the above-mentioned manufacturability value. Moreover, since the frequency changed as compared with the order-received prediction data 11 about the yield data 13, the count data 14 of housekeeping substitute max, and the manufacture unit data 15 is low, you may enable it to memorize the once inputted data among the data inputted for a long period of time if needed. In this case, what is necessary is to input only the order-received prediction data 11 in S1 shown by drawing 9 . Moreover, the weight value modification section 107 (refer to drawing 3) is a weighting factor W2 at S10 (refer to drawing 9). Although it was made to increase a value, the need is accepted, and they are other weighting factors W1 and W3. It is made to change and you may enable it to perform still finer array evaluation.

[0039] In choosing the class of intermediate product used for manufacture of a kind of a certain kind of final product with which an order received is predicted, when it is possible to manufacture two or more kinds of final products using two or more kinds of intermediate products if the system 1 of this example is used as explained above, it can decide upon manufacturing planning of a final product in consideration of the manufacture unit of an intermediate product, and the yield to the intermediate product of a final product, and is **. Furthermore, since it was made for the count of a plan of a housekeeping substitute of an intermediate product to turn into below the count of max of the housekeeping substitute defined beforehand, it can prevent that the count of a housekeeping substitute increases and manufacture effectiveness gets worse.

[0040]

[Effect of the Invention] As explained above, when manufacturing two or more kinds of 2nd product using two or more kinds of 1st product according to this invention, in order to manufacture the various kinds of the 2nd product by which the manufacture demand was carried out It becomes possible to decide upon manufacturing planning of the 2nd product according to the lot conclusion which defined the class and its amount of supply of the 1st product to be used based on the manufacturability value for every class of the 2nd product over the various kinds of the 1st product, and the supply lot for every class of the 1st product. The above-mentioned lot conclusion performs matching with the combination for every class of the 1st product for meeting the manufacture demand, and the 2nd product and the manufacture amount required, and the amount of supply according to different combination by which sequential generation is carried out, and is based on the result of the matching. And a predetermined performance index Since it was made to output the combination from which it uses, sequential evaluation of class doubling is carried out, and the value of a performance index serves as best, the decision activity of complicated manufacturing planning from which the yield differs for every combination and a supply lot differs for every class of the 1st product is mitigable. Furthermore, since the class of the 2nd product used for manufacture includes the term which becomes settled with the number of classes of the 1st product which is below a predetermined number in the above-mentioned performance index, it becomes possible to decide upon manufacturing planning which uses many 1st flexible product as much as possible. Based on a lot conclusion, determine the manufacture sequence of the 2nd product, ask for the count of a housekeeping substitute of the 1st product from this decision result, and if there are more computed counts than the count of an upper limit appointed beforehand, moreover, with the number of classes of the 1st product of a performance index Since the weighting factor of the term which becomes settled is made to increase and it was made to repeat a lot conclusion again, the count of a housekeeping substitute becomes possible [deciding upon manufacturing planning which is settled below in an upper limit]. While the above determines the combination for every class of the 1st product and the 2nd product whose count of a housekeeping substitute of the 1st product decreases while the manufacturability over the 1st product of the 2nd product is suitable, the manufacturing-planning decision exchange equipment which can output the amount of supply of the 1st product by the lot unit can be offered.

[Translation done.]

CLAIMS

[Claim(s)]

[Claim 1] It is equipment used in order to decide upon manufacturing planning of the
2nd product in the case of manufacturing two or more kinds of 2nd product using two
or more kinds of 1st product. The manufacture amount required for every class of the
2nd product of the above, The manufacturability value for every class of the 2nd
product of the above over the various kinds of the 1st product of the above, The input
section for inputting the supply lot for every class of the 1st product of the above,
Manufacturing-planning decision exchange equipment characterized by including the
lot conclusion processing section which outputs the class and the amount of supply of
the 1st product of the above used in order to manufacture the various kinds of the 2nd
product of the above by which the manufacture demand was carried out based on the
manufacture amount required, manufacturability value, and supply lot which were
inputted from the above-mentioned input section.

[Claim 2] The above-mentioned manufacturability value contains the yield. The
above-mentioned lot conclusion processing section The combination generation
section which generates the combination to which the 1st product of the above and the
2nd product of the above were made to correspond for every class, An output is
answered from the above-mentioned combination generation section. The
manufacture amount required of the various kinds of the 2nd product of the above
with the above-mentioned combination It ** by the yield for every class over the 1st
matched product of the above. The lot matching processing section which computes
the amount sum total of supply which carried out the integral multiple of the above-
mentioned supply lot for calculating the initial complement for every class of the 1st
product of the above, and satisfying the sum total of the initial complement for every
class of the 1st product of the above, The term which answers an output from the
above-mentioned lot matching processing section, and becomes settled by the yield of
the whole to the amount sum total of supply of the 1st product of the above of the sum
total of the manufacture amount required of the 2nd product of the above, The
combination evaluation section which evaluates the above-mentioned combination
using a performance index including the term which becomes settled with the number
of classes of the 1st product of the above contained in the above-mentioned

combination is included. The above-mentioned combination generation section It is manufacturing-planning decision exchange equipment according to claim 1 which carries out sequential generation of the different combination according to evaluation by the above-mentioned combination evaluation section, and is characterized by the above-mentioned combination evaluation section outputting the combination from which the value of the above-mentioned performance index serves as best among the combination by which sequential generation was carried out [above-mentioned].

[Claim 3] The above-mentioned combination evaluation section is manufacturing-planning decision exchange equipment according to claim 2 characterized by including the term which becomes settled with the number of the classes whose classes of the 2nd product of the above further used for manufacture among the 1st product of the above contained in the above-mentioned combination are below a predetermined number in the above-mentioned performance index.

[Claim 4] The manufacture sequence decision section as which the above-mentioned equipment determines the manufacture sequence of the 2nd product of the above further based on the output of the above-mentioned lot conclusion processing section. The count calculation section of a housekeeping substitute which computes the count of a housekeeping substitute of the 1st product of the above based on the output from the above-mentioned manufacture sequence decision section, The count comparator which measures the count of an upper limit beforehand appointed at the count which the above-mentioned count calculation section of a housekeeping substitute computed is included. The above-mentioned lot conclusion processing section Furthermore, manufacturing-planning decision exchange equipment according to claim 3 characterized by making the weighting factor of the term which becomes settled with the number of classes of the 1st product of the above in the above-mentioned performance index increase, and repeating processing again when judged with there being more counts computed by the above-mentioned count comparator than the above-mentioned count of an upper limit.
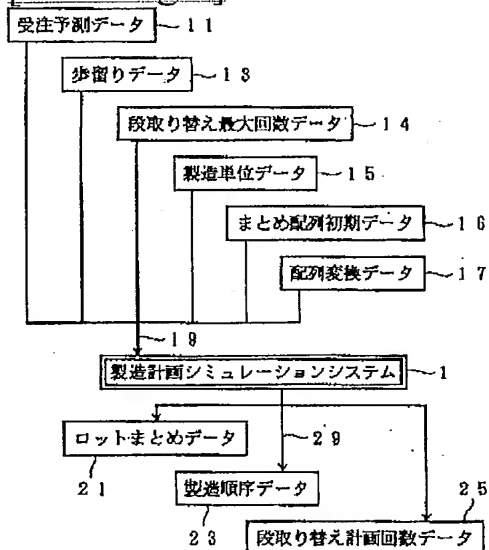

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* NOTICES *

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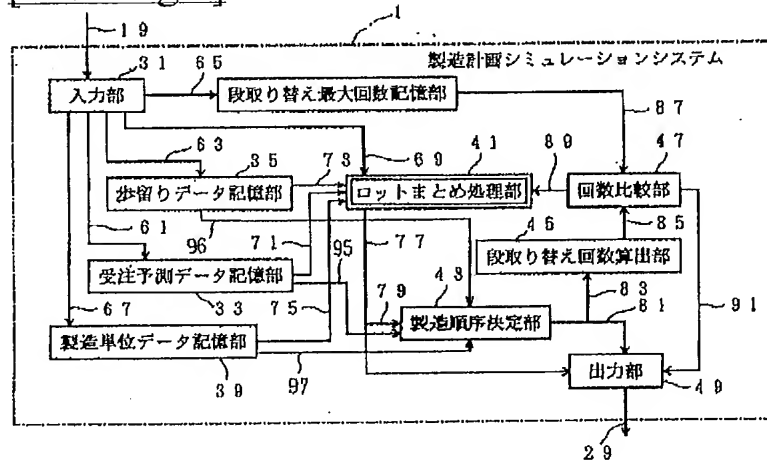damages caused by the use of this translation.

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not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

[Drawing 1]

[Drawing 2]

[Drawing 4]

日 / 製品	1	2	3	4	5	6	7	8	9	10
a	1	1	1	0	1	1	1	1	1	1
b	1	0	1	0	1	0	1	0	1	1
c	0.5	0	0.5	0	0	1	0	0	0.5	0

[Drawing 5]

最終製品 / 中間製品	a	b	c
A	1.0	0.0	0.9
B	0.0	1.0	0.8
C	0.0	0.7	0.0

[Drawing 6]

1 0 日	2 回
2 0 日	4 回
3 0 日	6 回

[Drawing 7]

A	6
B	6
C	8

[Drawing 10]

a	9
b	6
c	2.5

[Drawing 3]
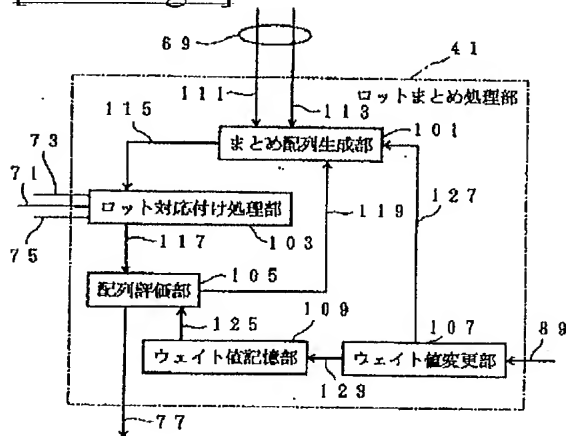
[Drawing 8]

（a）

    A [a]

    B [b, c]

（b）

    A－a，B－c

（c）

    A [c]

    B [b，a]

（d）

    A－□ ，B－c

（e）

    A [a，c]

    B [b]

（f）

    A [a]

    B [b，c]

    A－□ ，B－c

    A－a ，B－c

    A－a ．B－b

[Drawing 11]
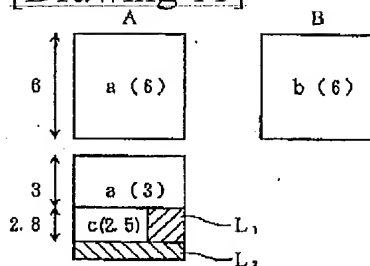
[Drawing 12]

最終製品 （対応する 中間製品）	計画日										合計
	1	2	3	4	5	6	7	8	9	10	
a（A）	1	1	1	0	1	1	1	1	1	1	9
b（B）	1	0	1	0	1	0	1	0	1	1	6
c（A）	0.56	0	0.56	0	0	1.11	0	0	0.56	0	2.78

[Drawing 13]

中間製品	計画日										合計
	1	2	3	4	5	6	7	8	9	10	
A	1.56	1	1.56	0	1	2.11	1	1	1.56	1	11.78
B	1	0	1	0	1	0	1	0	1	1	6

[Drawing 14]
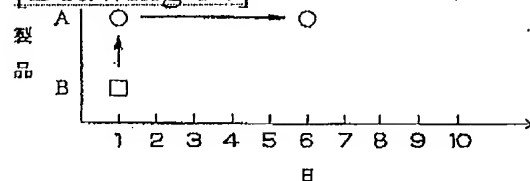
[Drawing 15]

中間製品 ＼ 最終製品	a	b	c
A	可	否	可
B	否	可	可

[Drawing 9]

開始

データを入力する　S1

最終製品の受注量合計を算出する　S2

まとめ配列を生成する　S3

ロットの対応付け処理を行う　S4

配列を評価する　S5

評価値OK？　S6
　NO
　YES

中間製品の製造順序を決定する　S7

段取り替えの計画回数を算出する　S8

最大回数≧計画回数　S9
　NO
　YES

N_2 を増加させる　S10

データを出力する　S11

終了

[Translation done.]